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Project Report

BRITISH COLUMBIA FINANCIAL REVIEW: THE ISSUE OF PREVENTIVE MAINTENANCE

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Executive Summary—Preventive Maintenance

This report examines the preventive maintenance practices of government ministries, agencies and Crown corporations. Regular preventive maintenance is essential to preserve the value of public assets over the longer term and to avoid costly capital and repair expenditures.

The report concludes that preventive maintenance was reduced below prudent levels or suspended altogether by a number of agencies.

One of the most serious examples of deferred maintenance is B.C. Hydro. In response to a policy direction to reduce costs, Hydro reduced regular preventive maintenance. The result is a deterioration in Hydro's production and customer service facilities, and a maintenance backlog of about $125-$175 million.

Insufficient maintenance was also identified for highways and schools.

Overall, the report concludes that insufficient preventive maintenance has:

- Created a government-wide maintenance "deficit" that could easily be greater than $1 billion.
- Sharply increased future expenditure requirements for both more extensive preventive maintenance and capital replacement.

The report recommends that:

- New measurement methods and reporting formats be developed to monitor the level of maintenance required and carried out within ministries.
- The budget management structure be redesigned to eliminate incentives to divert maintenance funds to ongoing operations.

The Issue of Preventive Maintenance

The prolonged deferral of maintenance expenditures appeared relatively frequently in our examination of ministries and other government entities. Apparently, this practice was used during the 1980s to reduce expenditures, in enough places to be regarded as a fairly common practice. This has serious consequences. Maintenance expenditures will require increased funding at some time in the future, and the full extent of these expenditures is not necessarily included in the annual budget or five-year forecast.

A. Maintenance—The preservation of assets

The major assets of the government include the infrastructure of the province—the road and bridge network, schools, hospitals, and public buildings—as well as the equipment, such as vehicle fleets and computer equipment, used by the government in its delivery of services to the public. The government is entrusted by the citizens to preserve the value and usefulness of these assets. In a number of cases, the effect of foregoing maintenance was apparently marked by the absence of adequate asset control and inventory systems.

The total cost of this provincial asset base is enormous. It is the invested capital from past generations. The Auditor General refers to the goal of achieving "a least lifetime cost" for these major assets.

Asset costs can be described in terms of the life cycle of the asset:

- **Construction Costs** — The initial capital cost of new construction.
- **Operating Costs** — The costs of operating the asset.
- **Maintenance Costs** — Expenditures intended to protect an asset from excessive deterioration and to keep it functioning at acceptable service levels. Spending may reflect concerns about safety or actions to preserve or protect the asset. Maintenance work is generally described as **routine** (day-to-day repair of defects and general upkeep) or **periodic** (larger in scope and needing to be planned on a regular basis).
- **Rehabilitation Costs** — Expenditures to restore the asset close to its original service level, to prolong its service life. An asset is

rehabilitated when regular maintenance activities are no longer sufficient to protect it. This is often referred to as retrofitting or major maintenance.

- Reconstruction Costs — Capital construction begins another life cycle. Rebuilding generally occurs when the costs of maintaining or rehabilitating an asset exceed the costs of reconstruction.

These costs are interrelated. For example, certain types of building construction can be more expensive to operate and maintain than others. Particularly for major assets like schools, construction costs can be less than the operating and maintenance costs over its lifetime. Appropriate spending on maintenance and rehabilitation can extend the useful life of an asset. Maintenance expenditures tend to increase with the age of an asset. They can often be reduced as a result of rehabilitation.

Timing is important. Spending too little or deferring maintenance for years can lead to more rapid deterioration and increased future costs. Deferring rehabilitation can have even greater future costs because the deterioration is more severe. In an example from the report *"Good Roads Cost Less"*, the rehabilitation of road surface is estimated to cost about $100,000 per kilometre. If left to deteriorate further until reconstruction is required, the report estimated the cost at about $300,000 per kilometre.

Careful management of these expenditures can yield significant returns. To illustrate, the Auditor General refers to a study on the ideal life cycle of a paved road. For a paved road with a useful life expectancy of 27 years, appropriate maintenance and rehabilitation can economically extend the road's useful life to 45 years.

B. Major findings

Recognizing the need for appropriate levels and timing of maintenance expenditures is, in principle, easy. Actually obtaining the necessary funds and effectively and efficiently protecting the asset can require great persistence and trade-offs, particularly in times of economic restraint.

The evidence seems to suggest that, in many ministries and government entities, some assets have not been adequately maintained. Table 1 lists, for some of the ministries and entities reviewed, examples of deferred maintenance and the possible financial consequences. Three examples are outlined below.

Table 1
Examples of "lurking expenditures"as a result of deferred maintenance

Ministry	Asset/Type	Status	Amount
Transportation and Highways	Highways Rehabilitation	Approved funding less than budget submissions for 1990/91 and 1991/92.	$80-90 million annual shortfall
	Bridges Rehabilitation	Approved funding less than budget request.	$38 million shortfall in 1990/91
	Bridges Seismic Retrofitting	Upgrade bridges to current seismic standards.	$600 million over 10 years
Forests	Maintenance of roads and bridges (also used by public)	Ministry believes inadequate sums have been expended.	$3 million funding shorfall
Tourism	Provincial Archives	Additional costs to complete lower asbestos removal.	$2-5 million
	B.C. Royal Museum	Upgrade to current operating and safety standards (fire, escalators, asbestos removal).	$20 million
	Barkerville and other heritage sites	Upgrade fire protection and security aspects.	$3.2 million est. for Barkerville requested 1992/93 $350,000 and 1993/94 $150,000 for various properties.
B.C. Hydro	Preventive maintenance - production and customer service facilities	Inadequate levels of maintenance expenditures starting in mid 1980s. Reliability is forecast to be affected in the future unless maintenance levels are restored.	$25-$30 million/yr. over five years budgeted for "catch-up" maintenance program, in addition to the normal ongoing baseline maintenance program.

Table 1 (Continued)
Examples of "lurking expenditures"as a result of deferred maintenance

Ministry	Asset/Type	Status	Amount
Education	School buildings - major maintenance, enhancement and replacement	Spending levels fluctuated widely in 1980s suggesting schools are not being as well maintained as they might be. School district requests for maintenance have been relatively consistent, and invariably exceeded the amounts approved.	Ministry estimates require $1.2 billion over 5 years for significant maintenance/ replacement programs in existing schools and $550 million for new construction for increased enrollment. Annual amounts fall below trendline of past expenditure levels.
	School building retrofitting	Upgrade to current seismic construction requirements.	$750 million
Advanced Education	Post-secondary facilities	Spending levels for major maintenance, enhancement, replacement, and new construction fluctuated widely through 1980s. High levels in last two years reflect new construction to add student places.	Trendline of past expenditures suggests potential problems with deferred maintenance.
B.C. Pavilion Corporation	Facilities repairs and maintenance	Deferred maintenance costs; funding unavailable for two years.	$1 million
Government Services	Government Air Services Hanger	40 year old building needs replacement. Little maintenance expenditure over past years.	$3 million
	Computer Hardware and Software	Aging and obsolete equipment results in high maintenance costs.	N/A

Table 1 (Continued)
Examples of "lurking expenditures"as a result of deferred maintenance

Ministry	Asset/Type	Status	Amount
B.C. Systems	Computer and ancillary equipment	High level of capital expenditures maintained because of equipment's average life cycle of three to five years.	N/A
Finance and Corporate Relations	Computer Systems	Deferred maintenance implications - significant upgrading expenditures required.	$6 million over next five years
Environment	Vehicle Fleet	Deferred maintenance on vehicles.	N/A
PNE	Buildings and fixtures	Discretionary maintenance has been discontinued because of corporations short and uncertain future.	N/A
Municipal Affairs	Municipal infrastructure (sewers and wastes)	Revenue Sharing Fund • significant commitments not funded, since expenditures of capital grants lags approval of grants to be paid. • annual deficit likely; 1990/91 accounts show $114 million available but $100 million already committed. Future demand likely to grow as municipal infrastructures age.	N/A

1. Road and bridge rehabilitation

The Ministry of Transportation and Highways provides an interesting case. Maintenance of roads and bridges is clearly recognized by the Ministry as vital to its ability to achieving good value for money. The field of road construction, maintenance and rehabilitation is well developed in North America—numerous research studies address specific issues. Standards of best available practices are well documented, and the ministry continues to refine them. The 1991 Annual Report of the Auditor General included an assessment of how the ministry ensures that the road and bridge network is maintained at the least lifetime cost. The report was supportive of the ministry's overall efforts and included specific recommendations for future initiatives. The need for and benefits from an appropriate road and bridge maintenance and rehabilitation program are therefore well recognized.

Within this context, the approved funding for highway rehabilitation has typically been less than the budget request. For the current fiscal year, the shortfall was $90 million For the prior year it was $80 million. If the budget submissions are an accurate reflection of the necessary highway rehabilitation, some roads will be left to deteriorate, with significant financial consequences later on. Bridge maintenance appears to have suffered similar underfunding. In addition, the devastation caused by the 1989 California earthquake has prompted an evaluation of the need for upgrading bridges to today's seismic standards. Initial indications are that such retrofitting could add a total of $600 million to the rehabilitation program or $60 million annually if spread over a ten year period.

2. B.C. Hydro: a $125-$175 million maintenance deficit

From about 1983 until 1988 B.C. Hydro spent smaller amounts on regular preventive maintenance, as the corporation was placed under severe economic restraint by the shareholder. Management believes that the level of maintenance expenditure in the mid-1980s was inadequate. They consider that severe winter storms were a contributing factor.

According to the current Business Plan, catch-up maintenance expenditures are now required. Starting in fiscal 1992, B.C. Hydro will spend about $150 million per year for five years on production and customer service facilities. Of this amount, $120 million is directed to on-going maintenance and $25-$30 million for catch-up of deferred maintenance. The catch-up program is forecast to cost about $125-$175 million and is designed to meet a maintenance standard which, while not as high as the company generally followed ten years ago, is both appropriate and necessary to maintain system reliability at target levels.

3. Schools

The province has more than 1500 public schools. The age distribution of these facilities shows 75 per cent of the facilities to be more than 20 years old and only 1 per cent to be less than five years old. The number of schools would suggest the need for relatively consistent levels of spending on maintenance from year-to-year. The age of many facilities points to the growth of maintenance spending in the future.

In 1988, the Auditor General looked at the Ministry of Education from the perspective of the funding for school buildings and other facilities. School districts actually own and operate the schools, but the Province provides a substantial portion of operating costs and debt repayment for construction and major repairs.

In the 1980s, the capital amounts actually approved for maintenance and repairs fluctuated widely, although school districts had generally requested similar levels of funding from year-to-year. The requests invariably exceeded the amounts approved. Lack of spending on maintenance defers costs, but cannot avoid them. Over the longer term, deferrals will often actually result in increased maintenance costs.

The consequences of past shortfalls in maintenance spending are not known in terms of the service life of schools and the "lurking" expenditure requirements for their maintenance. The ministry is, however, currently forecasting a need for $1.2 billion over the next five years for significant maintenance/replacement programs in existing schools, as well as a $750 million program for seismic upgrading. The available data are not collected in such a way as to distinguish between true maintenance and that arising from prior neglect. It is clear, however, that the size of the future bill will be larger because of past deferrals in funding.

C. Social capital

Under the existing system of Estimates, it is relatively straightforward for a ministry to reallocate expenditures within an approved vote. Redirecting approved funding between votes is difficult and requires a formal proposal to Treasury Board. This procedural difference has resulted in a trend towards fewer votes per ministry in order to maximize the flexibility at the ministry level regarding how the total approved funding is spent.

During the restraint years of the 1980s, the Ministries of Health, Education and Advanced Education took advantage of the available flexibility and redirected approved spending for maintenance to other operating costs such as salaries. This resulted in substantial deferred maintenance due to the aging stock of school buildings, hospitals and university buildings. Because of the significant cumulative shortfall in maintenance expenditures, the above ministries have now requested large social capital increases to address what has become a critical problem.

Social capital budgeting policies now require certain ministries to develop five-year capital plans each year. These plans are the foundation for ministries' annual capital budget submissions. Each ministry also submits a detailed capital budget request for the first two fiscal years of the five-year plan. Treasury Board reviews these requests and establishes funding envelopes.

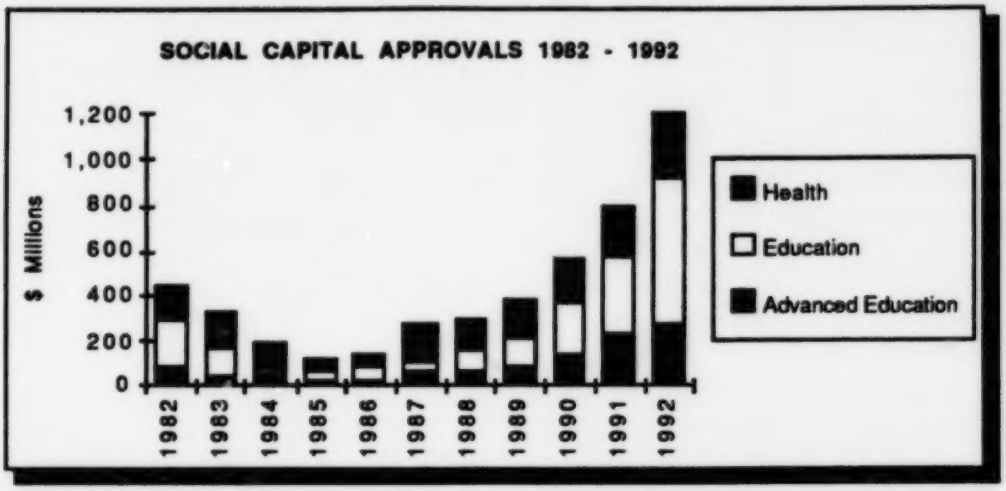
Ministries that participate in the social capital budgeting system are Health, Education, Advanced Education and Attorney General. Social capital projects are not expensed in the year in which the construction occurs. Social capital projects only affect their budget proposals through future increased debt service costs. Together they received approval for $1.27 billion for capital expenditures in 1991/92. Other ministries must expense capital expenditures in the year in which they occur and receive approval for these expenditures through the normal budget process.

Effectively, the current policy of allowing ministries to easily transfer money within a vote, combined with the policy of deferring social capital expenditures, has created a mechanism for the ministries that are part of the social capital program to shift approved expenditures for maintenance "off budget", thereby increasing the amount of funding available for other programs, projects and pressures.

The province is expected to undertake the required capital maintenance necessary to return schools, hospitals and university buildings to acceptable standards and safety. Unfortunately, the length of time over which the maintenance costs have been deferred has increased the urgency and cost of undertaking certain improvements.

This policy thus creates the potential for abuse of the system. Schools, hospitals and universities have the ability to submit reasonable requests for funding of maintenance, with no intention of using the money for the stated purpose. Eventually, the improvements are undertaken as part of the social capital program. This results in increased annual funding for other purposes and moving deferred maintenance charges out of the annual budget process.

The following graph illustrates the trend in capital spending for schools, hospitals and universities since 1982.



D. Conclusions

- Past and current deferrals of maintenance expenditures are contributing to a rapidly growing future requirement for capital funds. The expenditures required can be described as "lurking" because they are not fully included in the annual budget or five-year forecast, or because the size of future costs is more uncertain than would have otherwise been the case The ultimate size of this future demand for funds is difficult to estimate, but could represent as much as several billion dollars.

- Maintenance expenditures are highly vulnerable to deferral. Pressures for short-term savings seem to make maintenance a ready target, because the consequences of inadequate maintenance often only become apparent over time. Whether maintenance spending is funded from operating or capital budgets, past practice demonstrates a willingness to postpone maintenance spending in order to have money available for other operating costs or provincial priorities.

- Ministries need to know whether the infrastructure is being adequately maintained in order to predict future maintenance costs and to manage the infrastructure in a way to achieve least lifetime costs. They must understand the potential financial and operating consequences of deferring maintenance spending. Some ministries currently lack the necessary information. At present, ministries also have difficulty in monitoring maintenance spending because maintenance is supported by both operating and capital funds.

- Legislators need to know the financial implications of deferring or partially funding maintenance. When approving the level of funding for maintenance,

they have to accurately assess the comparative future costs of deferral on maintenance.

- The Province's ability to reduce its deficit will be made more difficult by greater uncertainty and unavoidable expenses for overdue maintenance.